Information Technology and Air Traffic Management

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Technology

- **Major Advances over Last 20 Years with Potential to Impact ATM**
  - **Small Computers and Reliable Software**
    - **Aircraft Flight Management Systems**
  - **Universal Timing Accuracy to 3 nano seconds**
    - **GPS State Vectors for every Aircraft**
  - **Data Base Management Systems and the Internet**
    - **ETMS and Weather Data Collection and Dissemination thru FAA CDM System**

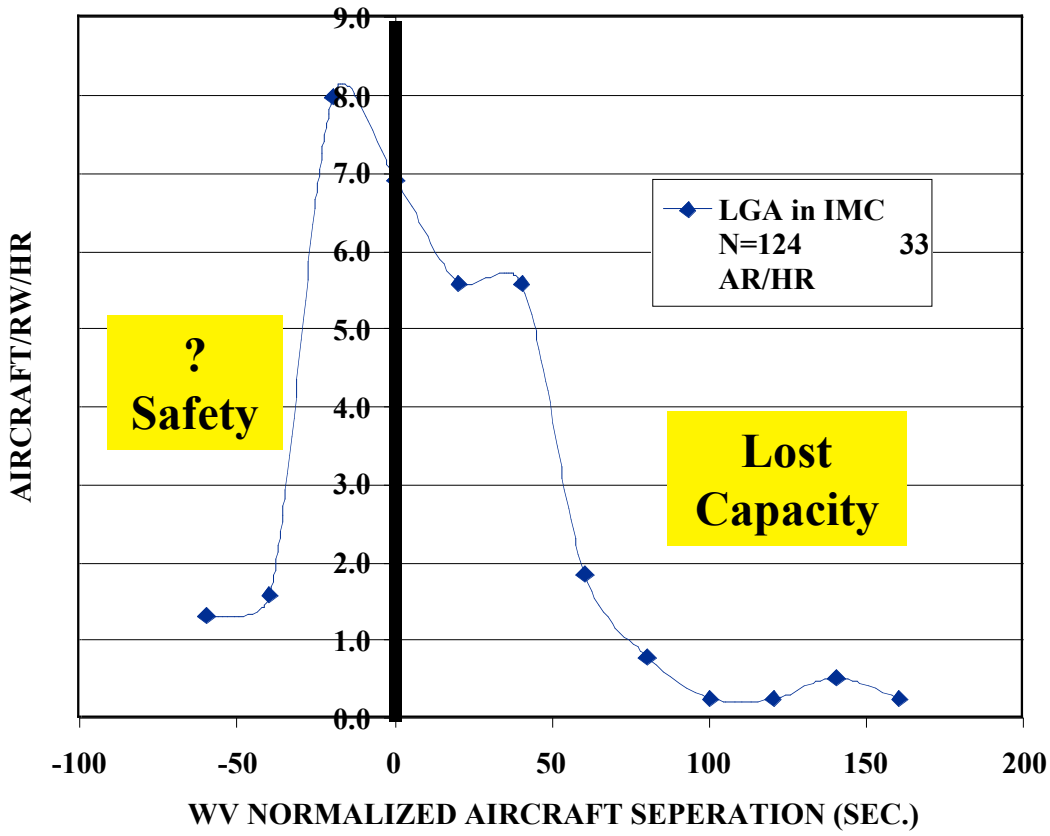
Technology Could Enable

- Complete Knowledge of Aircraft 4-D State Vector
  - Trajectory Based Flight Management and Required Time of Arrival Capability to < 30 Seconds
  - Aircraft Based Separation Assurance
- Dissemination of Common Weather Prediction and Aircraft State Vector Information to All Flight Planers and Decisions Makers over the Internet
  - Optimum Use of the Air Transportation Network
- Development of Small Unattended Airport Flight Separation Assurance System
  - Better Utilization of Nation's Runway Infrastructure

Technology Has Not Provided

- **Sharing Information Between Aircraft for Conflict Detection and Collision Avoidance**
  - **No Agreement on Policy**
  - **No Agreement on Wireless Data Links**
- **Ability to Deal with Weather Prediction Uncertainty over a 3-6 Hour Period of Time**
  - **Inability to Accurately Forecast Convective Weather**
  - **Inability to make Flight Planning Decisions in an Inherently Uncertain Environment**
- **Minimum Aircraft Spacing, Required Time of Arrival Airport Efficiency**
  - **Imprecise Arrival Slot Controls Policy**
  - **Static Wake Vortex Separation**

Capacity vs. Safety



Research Required

- Airport Arrival Slot Allocations for Maximum Efficient Use of Runways
  - A New RW Slot Auction Market Exchange System Needs to be Developed
- Ability to us ~90% of Maximum Safe Capacity with ~10% Uncertainty due to Weather and Equipment
  - Improved Decision Aids need Development
- Transfer of Separation Assurance to Aircraft under Mixed Equipage Conditions
  - ADS-B Data Links Decision and new ATC Paradigm Needs to be Developed and DEMONSTRATED
- Removal of Wake Vortex Static Safety Buffers
  - Dynamic WV Separation System needs to be Developed
- Stochastic Modeling & Optimization of Traffic Management
  - New Models need to be Developed to Facilitate Designs of Above